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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/346,678	07/02/1999	MASAAKI IWANE	35.C13630	2744

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EXAMINER

DIAZ, JOSE R

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 02/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	09/346,678		IWANE ET AL.	
	Examiner		Art Unit	
	José R Díaz		2815	AW

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7, 9, 10 and 12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7, 9, 10 and 12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: |

DETAILED ACTION

This Office Action is in response to an amendment filed December 6, 2000 on which Applicant amended Claims 1,5,6 and 16, canceled Claims 4 and 21-25, and added Claims 26-28. Upon a carefully review of the prior art, Examiner considers that the reference Migita (US Pat. No. 5,348,907), cited in the previous Office Action, reads over claim 4, which is the new limitation included in claim 1. Furthermore, the indicated allowability of claims 5, 15 and 17-20 is withdrawn in view of the rejections presented in this Office Action. Therefore, this Office Action is made Non-Final.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 7 and 9 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 recites that "an angle formed by any arbitrary two cutting lines, contained in the surface and not coming into coincidence", this limitation is confusing since it is not clear how the angle is formed if the cutting lines are not coming into coincidence (e.g. the cutting lines are parallel lines).

Claim 9 are rejected due to their dependency on claim 7.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 10 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Barnett et al. (US Pat. No. 4,818,337).

Regarding claim 10, Barnett et al. teaches a photoelectric conversion element (see figs. 1 and 2) comprising an anti-reflection layer (see col. 5, lines 60-61), silicon layers (see col. 5, lines 49-57), and an electrode (see col. 5, lines 56-60), provided from a light incident side (see col. 5, lines 58-60), wherein all of the silicon layers are single-crystal silicon layers (see col. 6, lines 15-18), and wherein the silicon layers comprise an n⁺ layer, and a p- layer of about 30 μ m thickness (see col. 5, lines 46-48 and col. 6, lines 44-45), provided from the light incident side, wherein a surface of the silicon layers has a (111) plane (see col. 6, lines 22-23), and wherein any deviation of said surface from said (111) plane is within an angle equal to 24/60ths of a degree (0024') (see col. 6, lines 16-17, wherein Barnett et al. teaches that the epitaxial layers are grown with the same crystal orientation as the substrate).

Regarding claim 12, Barnett et al. teaches a p⁺ layer (14) is provided between the p- layer (11) and the electrode (18), and the electrode is in contact with the n- layer (16) (see fig. 2).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rubin (US Pat. No. 4,089,705) in view of Barnett et al. (US Pat. No. 4,818,337).

Regarding claims 7 and 9, Rubin teaches a silicon solar cell comprising an angle formed by any arbitrary two cutting lines contained in the surface and not coming into coincidence is represented by θ , and θ satisfies the expression $|\cos\theta| = \frac{1}{2}$ or $\theta = 60^\circ$ (consider the hexagonal cell shown in fig. 3).

However, Rubin fail to teach the silicon active layer has (111) plane orientation. Barnett et al. teaches that it is well known in the art to form solar cell comprising silicon active layers having (111) orientation (see col. 6, lines 15-17 and 22-23). With regards

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to the deviation from the (111) plane, Barnett et al. teaches that the epitaxial layers are grown with the same crystal orientation as the substrate (see col. 6, lines 16-17).

Rubin and Barnett et al. are analogous art because they are from the same field of endeavor as applicant's invention. At the time of the invention it would have been obvious to a person of ordinary skill in the art to include silicon active layers having (111) orientation. The motivation for doing so, as is taught by Barnett et al., is providing an efficient thin active layer on a low-cost silicon substrate (col. 4, lines 3-5). Therefore, it would have been obvious to combine Barnett et al. with Rubin to obtain the invention of claims 7.

Response to Arguments

Applicant's arguments, see remarks, filed December 29, 2003, with respect to claim 7 have been fully considered and are persuasive. The rejection of claim 7 has been withdrawn. Furthermore, the indicated allowability of claims 9-10 and 12 is withdrawn in view of the rejections presented in this Office Action.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ohmi et al. (US Pat. No. 5,362,672) discloses growing Si monocrystal layer having (111) orientation and regular hexagonal or triangular cutting lines (see figs. 6A and 6B); and Tsutsui (JP 62045025 A) discloses a regular hexagonal cutting lines (see fig. 1).

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R Díaz whose telephone number is (703) 308-6078 or (571) 272-1727, after February 9, 2004. The examiner can normally be reached on 9:00-5:00 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Tom Thomas

JRD